Left with Robert Anthropometry

PHYSICAL MEASUREMENTS

OF

THE SAILOR.

BRITISH MEDICAL ASSOCIATION CANCELLED

BY

STAFF-SURGEON C. MARSH BEADNELL.

London:

JOHN BALE, SONS & DANIELSSON, LTD.,

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"The Proper Study of Mankind is Man."

—*Pope.*

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BRITISH MEDICAL ASSOCIATION
CANCELLED

Physical Measurements of the Sailor.

By Staff-Surgeon C. MARSH BEADNELL.

The importance to the Empire of the physical condition of the sailor, in the days when masts and yards were dominant, could scarcely have been overrated. At the present juncture, however, the fact that thews and sinews, important though they be, no longer hold a paramount position in the field is becoming more and more forcibly thrust upon us.

We are now applying to the sailor, in an artificial and concentrated form, the principle that on a vast scale, and for countless ages, has been exercised upon living beings by that inscrutable force we call Nature.

The daily number of foot tons of work performed by the pre-Nelsonian mariner was of necessity considerably in excess of that exhibited by the man-of-wars' man of to-day, and the deduction that, in the comparatively near future, physical labour in the Navy will suffer a still further diminution is a legitimate one.

The sailor—like the Whale hesitating between beast and fish, or ornithorynchus hovering between an egg-laying quadruped and a bird suckling its young at the breast—is in a critical phase.

On one side of him are force-generators of immense size and power; on the other, instruments of the subtlest delicacy, and all around him machinery of ever-increasing but never-ending intricacy.

He is daily called upon to deal with forces which, though as docile and tractable as a child so long as they are led by an intelligent hand, break forth, Vesuvian-like, into the most ungovernable fury, spreading disaster far and wide, the moment they are mal-treated.

He has, perforce, to confess that no amount of big-lunged shouting will enable him to carry on a conversation through ten miles of wireless space, that the strength of a Hercules will not project massive missiles of war

to a height of 5,000 feet above the summit of Mont Blanc, and that unlimited enthusiasm will not locate an electric short circuit.

The *corpus virile* is beginning to bow the knee at the shrine of intellect—in a word, *the sailor is adapting himself to a new environment.*

In the year 1897 I made a series of anthropometrical measurements[1] of several of the officers and men of *H.M.S. Powerful*, then on her way out to China. I had hoped to obtain a second series of measurements of the same individuals at the end of the commission, but unforeseen circumstances arose which effectually frustrated the fulfilment of my original intention.

However, on glancing over these measurements a few weeks ago, my disappointment somewhat moderated by the discovery that they were not so entirely devoid of interest as at first I had supposed them.

This, coupled with the remembrance of a promise I made in a weak moment, must be my excuse for publishing them. Moreover, I cherish the hope that when in years to come some naval surgeon essays a more exhaustive series of measurements, this humble attempt of mine may not be without its use in enabling him to ascertain the physical line of gression being adopted by the sailor of his day.

A few words of explanation concerning the Tables, of which there are four, are necessary.

Table I. is a record of 303 individual examinations arranged in horizontal lines; there are 45 vertical columns which indicate as follows:—

(1) The consecutive number of each individual examined.

(2) Names alphabetically arranged for each rating.

(3) Age in years.

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[1] The first suggestion that these measurements should be made emanated from Captain the Hon. Hedworth Lambton, R.N., who, during the whole of that somewhat eventful commission, manifested the greatest interest in the physical welfare of his men and officers—encouraging open-air games, both afloat and ashore—an interest that was reciprocated to the full by the late Commander Ethelston, R.N. It is my firm belief that the comparative good health of the naval brigade in beleagured Ladysmith was a direct resultant of the boat-deck races and poop gymnastics that were almost "routine" on board *H.M.S. Powerful* after evening quarters in the tropics.

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(4) Rank or rating.

(5) Height in inches. Since the height of the normal individual varies considerably (as much as 0·75 inch) in the twenty-four hours, it was taken in the early forenoon; the examinee being in bare feet.

(6) In every instance the person weighed was in a state of nudity. The weighing machine was of the steel-lever variety, and was constantly tested with standard weights.

(7) This, and each of the ensuing linear measurements, is in inches. The measurement represents the circumference of the chest at the end of a forced inspiration at which time the lungs are inflated to the individual's utmost capacity. The examinee was made to stand erect, arms dependent, the tape encircling the chest immediately below the nipples.

(8) Ditto column 7, but at the end of a forced expiration, when the lungs are depleted.

(9) Ditto column 7, but midway between normal inspiration and expiration. This column shows the normal chest circumference.

(10) Expansion of chest obtained by measuring the individual at the end of a forced inspiration and again at the end of a forced expiration and subtracting the latter measurement from the former. This column was obtained by a series of separate measurements, and forms therefore a control to column 7 and 8.

(11) Circumference of abdomen two inches below the navel.

(12) Circumference of right arm at level of nipple. This measurement was taken with the arm dependent and the muscles flaccid.

(13) Circumference of left arm. (Ditto column 12.)

(14) Mean circumference of arms. (Mean of column 12 and 13.)

(15) Circumference of right forearm two inches below the flexure of the elbow. Muscles flaccid.

(16) Circumference left forearm. (Ditto column 15.)

(17) Mean circumference of forearms. (Mean of columns 15 and 16.)

(18) Mean circumference of right upper extremity, *i.e.*, of right arm and forearm. (Mean of columns 12 and 15.)

(19) Mean circumference of left upper extremity, *i.e.*, of left arm and forearm. (Mean of columns 13 and 16.)

(20) Mean circumference of upper extremities, *i.e.*, of both arms and forearms. (Mean of columns 14 and 17.)

(21) Circumference of right thigh at level of extreme upper limit. Examinee standing.

(22) Circumference of left thigh. (Ditto column 21.)

(23) Mean circumference of thighs. (Mean of columns 21 and 22.)

(24) Circumference of right leg at level of greatest diameter of calf.

(25) Circumference of left leg. (Ditto column 24.)

(26) Mean circumference of legs. (Mean of columns 24 and 25.)

(27) Mean circumference of right lower extremity, *i.e.*, of right thigh and leg. (Mean of columns 21 and 24.)

(28) Mean circumference of left lower extremity. (Mean of columns 22 and 25.)

(29) Mean circumference of lower extremities. *i.e.*, of both thighs and legs. (Mean of columns 23 and 26.)

(30) Mean circumference of all the extremities. (Mean of columns 20 and 29.)

(31) Right-handed.

(32) Left-handed. In order to determine whether the individual was right or left-handed he was made to undergo the following tests: (1) To pick up an object. (2) To write his name. (3) To hold a cricket bat in position. (4) To touch an object immediately opposite him. In this way by observing the hand chosen or the attitude adopted one was enabled to class the individual as a dexter or sinister.

(33) Right-legged.

(34) Left-legged. To determine whether the individual was right or left-legged he was made to take a running kick at an object lying on the deck.[1]

(35) An indication of the power of the flexor and adductor muscles of the fingers and thumb of the right hand. The instrument used was a steel dynamometer, which was constantly tested by standard pressures.

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[1] In civil life it is a comparatively easy matter to discriminate between the right and the left-limbed persons, but it becomes a matter of no little difficulty when we have to deal with men who have had a military training. Drills of all kinds cater for the average, and any abnormal individual goes to the wall, for while Nature is urging him to fire from the left shoulder or to put the left foot forward his Instructor demands the opposite. In this way the right member, which by nature may be the inferior, becomes so educated that any patent distinction between the two sides disappears.

(36) Left grip. (Ditto column 35.)

(37) Mean of right and left grips. (Mean of columns 35 and 36.)

(38) This column indicates the number of pounds tension that can be exerted by the right and left upper extremities pulling in contrary directions upon a steel tension dynamometer, the examinee standing erect with his forearms held horizontally in front of but not in contact with the chest.

(39) Weight in pounds that can be lifted by right arm, the feet approximated and the left arm held at right angles to the body to prevent any "purchase." Instrument used—a tension dynamometer fixed between feet.

(40) Weight lifted by left arm, right arm at right angles to body. (Ditto column 39.)

(41) Mean of weight lifted with right and left arms. (Means of columns 39 and 40.)

(42) Index of strength. A figure of merit obtained by taking the mean of the mean pressure of grips, tensile force and the mean weight lifted, and dividing by 65·3 (the minimum number so obtained). (Mean of columns 37, 38 and 41 divided by 65·3.)

(43) Index of size. The mean of height, weight, normal chest circumference, and mean circumference of all the extremities divided by 50·84. (Mean of columns 5, 6, 9 and 30 divided by 50·84.)

(44) Index of physique. (Mean of columns 42 and 43.)

(45) Order of merit based on column 44.

Table II. Consists of 132 horizontal columns and 17 vertical, the former numbered, the latter lettered. It is constructed to show the maximum, minimum and mean measurements obtained by each class of individuals. Columns 23, 33, 43, 47, 54, 64, 74, 78, 85, 89, 90, 91, 101, 114, show ratios, thus in 23 C, the words "as 1 is to" are understood in front of the figures 9, 16. Similarly in 33 F the figures 0·962 are to be read "as 1 is to 0·962" and so on.

B to G indicate the class of individuals.

H shows the difference between the maximum and minimum of the same horizontal line.

K gives the total for the same horizontal line.

L, M, and N respectively indicate the average maximum and minimum for the same horizontal line.

Columns O to S form an accessory Table showing a more detailed analysis of the seaman class by subdividing the latter into its three component elements.

Table III. In this Table column

A shows the event. Each number in

B indicates a class; thus, 1 Boys and ordinary seamen. 2 Able seamen. 3 Stokers. 4 Marines. 5 Officers. 6 Miscellaneous.

C Names.

D Maximum or minimum.

E Ratings.

Table IV. In this Table I have endeavoured to show the relative weights of the Seaman, Marine, and Stoker. It also shows the slight loss of weight that occurred after twelve months in tropical and semi-tropical zones.

By column 7 of Table II. we see the weight of the average Stoker to be 6·36 pounds greater than that of the average Marine and 11·08 pounds heavier than the average Seaman. I regret that at this time I was unable to obtain more than eleven Stokers, but if the reader will refer to Table IV. he will there see a separate series of weights of 110 Stokers. This latter Table shows the loss of weight resulting, after twelve months in tropical climes, to be one pound per man, or, to be slightly more accurate, 103 pounds per 100 men.

Taking the mean of the ratios in the last columns we find that:—

Weight of Seaman : weight of Marine : weight of Stoker :: 93 : 96 : 100

In column 10 of Table II. the height of the average Marine is seen to be 1·5 inches above the total average height obtained, whereas that of the Boy is 0·9 inches below the average; in other words the average Boy of 17·42 years is 2·79 inches shorter than the average Marine of 23 years.

This marked difference is not due to the superior years of the Marine, for if we refer to the height of the able Seaman we find it to be 2·5 inches less than that of the Marine although the former is 0·8 years older.

Vertical growth in the seaman class ceases abruptly about the age of 19, when the seaman is in the "ordinary" phase of his career. Horizontal development, however, continues vigorously up to the age of 23·8 years. Columns 7 and 19 prove that the Boy in becoming

TABLE 1.

an ordinary seaman increases his weight by 7·24 pounds and his chest circumference by 1·69 inches, and further that the ordinary seaman in developing into an able seaman augments his tissues by 6·77 pounds in weight and 0·83 chest circumference.

This early cessation of vertical growth and its consequent exaggeration of horizontal growth amongst the seaman class is further exemplified by comparing the mean chest measurements in column 19. The peculiarity, which extends even to the executive officers (it being a matter of common observation that the average naval officer is considerably shorter, though broader, than his military *confrère* ashore), is, I believe, due to the custom of sleeping in hammocks at that period of life when vertical growth should be most active, to wit, between the ages of 15 and 20. The hammock is detrimental to vertical growth in two ways :—

Firstly, the position of a person sleeping in a hammock is such that the long axis of his body forms a curve lying in a vertical plane, the convexity of the curve being downwards: consequently the blood, which is the principal vehicle of nourishment to the growing tissues, tends to gravitate out of the lower extremities into the dependent (posterior) portions of the trunk.

Secondly, owing to this curved configuration of the body, the bones of the lower extremities and of the vertebral column are in a constant condition of longitudinal compression ; the stresses thus set up impede growth in a longitudinal though not affecting that in a horizontal direction. Hence a considerable portion of the molecular energy that might be devoted to increasing the length of the bones is occupied in resisting these longitudinal pressures. A simile may make my meaning clearer. A swimmer puts forth enough energy to convey his body a distance of, let us say, one mile in one hour through still water. If swimming in a lake he would in one hour travel a distance of one mile both through the water and over the bottom of the lake, but, if swimming towards the source of a river flowing at the rate of one mile per hour, he would at the end of the time be in precisely the same spot in relation to the bottom or banks of the river as he was at the beginning of the hour. All his energy has been expended in conveying his body through one mile of moving water, or in other words, *in resisting the pressures of the current.*

The superior height of the Marine is undoubtedly owing to the fact that by the time he adopts hammock life vertical growth has reached its culminating point.[1]

On referring to columns 29 and 32 of Table II., we are at once struck by the relatively large size of the Stoker's upper left extremity, the left arm being 0·75 inch greater circumference than the right, the mean of the remaining classes showing an excess on the right side of 0·238 inch. Anyone who carefully watches the operation of stoking will, I think, at once see the cause of this peculiarity. The shovel is a lever suspended by a fulcrum. Upon the short arm of this lever a force due to the weight of the coal acts vertically downwards; upon the long arm an opposing force exerted by the right arm also acts vertically downwards. The resultant of these two forces is transmitted by means of the fulcrum (the left hand) to the left arm. Hence the hypertrophy of the latter. On account of the more diversified movements of the forearms the hypertrophy on the left side is relative only, for although the right side is greater in circumference than the left, it is but 0.21 inch above the average, whereas the circumference of the left forearm is 0·34 inch above the average.

I must confess to being unable to give a satisfactory explanation of the somewhat curious fact that both legs of the Marine are in circumference much below the average, the left being 0·125 inch, and the right 0·335 inch below. These figures also show us that the left leg of the marine is more highly developed than the right. In all the other branches the right leg is superior to the left.

By columns 97 and 100 it will be seen that the pressure capable of being exerted by the grip of the right hand exceeds that of the left by 4·32 pounds. The Stoker, however, for reasons above mentioned, has the stronger grip on the left side by 0·72 pound.

The tensile force, as shown by columns 105, 106, 107, is an index of the strength of certain back muscles that extend from the spinal column to the shoulder blades.

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[1] Of course there are exceptions, but they "prove the rule." I once asked an unusually tall officer if he could in any way account for his superior height. "As a midshipman," he said, "I invariably slept on deck in the tropics, and on the gun-room table in the colder climes."

By column 114 we see that the weight lifted by the left arm of the Stoker is, to that lifted by the right arm as 1 : 1·073, the two next highest ratios being the able Seaman with 1 : 1·038, and the Boy class with 1 : 1·019; in the remaining three classes the ratio is reversed, the greater weight being lifted by the right arm. It should be remembered that in lifting a relatively heavy weight with the right arm the muscles principally used are those passing up and down the *left* side of the vertebral column.

The sole representative of column 129 occurred in the person of a Bandsman, who could perform equally complicated movements (*e.g.*, writing or playing) with either hand.

By column 120 we see, as might have been predicted, the strongest of the six classes represented by the able-bodied seamen, the least strong by that containing the officers, who are seldom called upon to use their muscles other than for recreative purposes. The Boys and ordinary Seamen have not been sufficiently long in the service to allow of the full development of their muscles.

The work (using the word in its scientific sense) of the Marine and Miscellaneous class is neither so constant nor severe as is that of the able Seaman class.

Finally the work of the Stoker is so rhythmical that it tends to develop special groups of muscles.

TABLE III.

A	B	C	D	E
Age, maximum	1	George Clarke	23	O.S.
	2	John McHenry	35	A.B.
	3	Joseph Wills	25	Sto.
	4	Wakeley Lowe	34	Pte.
	5	Archibald Urmston	37	Major
	6	Thomas Catlin	38	Band.
Age, minimum	1	William Sullivan	16·5	Boy
	2	John McLoughlin	19·9	A.B.
	3	John Jones	20	Sto.
	4	William Barnes	18·6	Pte.
	5	Robert Hamilton	15·8	Mid.
	6	Lionel Ranner	17·1	Drum.
Height, maximum	1	John le Quelence	71·7	O.S.
	2	Alfred Saunders	72·2	Lea Sea.
	3	Albert Buncombe	70·5	Sto.
	4	William West	71·5	Pte.
	5	Frederick Saunders	74·5	Lieut. R.M.L.I.
	6	Sydney Comden	70·3	S.B.S.
Height, minimum	1	Joseph Dow	61·2	Boy
	2	Thomas Jones	51·7	A.B.
	3	John Forwood	65·0	Sto.
	4	John Wilson	62·25	Sergt.
	5	Herbert Stewart	61·8	Mid.
	6	William Harris	61·8	Band.
Weight, maximum	1	John Le Quelence	182	O.S.
	2	Fred Humphreys	196	A.B.
	3	Albert Buncombe	172	Sto.
	4	Charles Warren	172	Corpl. R.M.L.I.
	5	Edgar Ellis	203	Engr.
	6	John Madgwick	234	Ship's Corpl.
Weight, minimum	1	Joseph Dow	107	Boy
	2	Abraham Little	112	A.B.
	3	John Jones	128	Sto.
	4	George Franklin	120	Pte.
	5	Fred Tottenham	100	Mid.
	6	Lionel Ranner	110	Drum.
Chest at end of inspiration, maximum	1	Walter Gover	38·60	O.S.
	2	James Dean	42·50	A.B.
	3	Albert Buncombe	39·70	Sto.
	4	Frank Turner	39·70	Pte.
	5	Edgar Ellis	41·80	Engr.
	6	John Madgwick	45·00	Ship's Corpl.
Chest at end of inspiration, minimum	1	Wilfrid Musgrove	31·50	Boy
	2	William Archer	32·70	A.B.
	3	John Jones	34·50	Sto.
	4	William West	33·00	Pte.
	5	Fred Tottenham	30·00	Mid.
	6	William Harris	32·70	Band.
Chest at end of expiration, maximum	1	Frederick Gregory	35·50	O.S.
	2	James Dean	39·00	A.B.
	3	Albert Buncombe	34·30	Sto.
	4	Charles Warren	34·50	Corpl. R.M.L.I.

TABLE III. (*continued*).

A	B	C	D	E
	5	Edgar Ellis	37·60	Engr.
	6	John Madgwick	42·00	Ship's Corpl.
Chest at end of expiration, minimum	1	Robert Williams	25·20	O.S.
	2	John McLoughlin	29·70	A.B.
	3	John Jones	31·50	Sto.
	4	James Goldring	29·00	Pte.
	5	John Middleton	26·20	Mid.
	6	Frederick Hunt	26·50	Dom.
Mean circumference of chest, maximum	1	Henry Passmore	36·50	O.S.
	2	James Dean	40·70	A.B.
	3	Albert Buncombe	37·00	Sto.
	4	Charles Warren	36·00	Corpl. R.M.L.I.
	5	Edgar Ellis	37·70	Engr.
	6	John Madgwick	43·50	Ship's Corpl.
Mean circumference of chest, minimum	1	Robert Williams	29·20	O.S.
	2	William Archer	31·37	A.B.
	3	John Jones	33·00	Sto.
	4	William West	31·50	Pte.
	5	Fred Tottenham	28·80	Mid.
	6	Fred Hunt	30·50	Dom.
Expansion of chest, maximum	1	Robert Williams	7·9	O.S.
	2	Charles Smith	5·5	A.B.
	3	Thomas Snudden	5·5	Sto.
	4	Frank Turner	8·2	Pte.
	5	Charles Beadnell	6·0	Surg.
	6	Fred Hunt	8·0	Dom.
Expansion of chest, minimum	1	Albert Attridge	1·7	O.S.
	2	Robert Maxwell	1·7	A.B.
	3	John Jones	3·0	Sto.
	4	Arthur Basten	1·8	Pte.
	5	Fred Tottenham	2·2	Mid.
	6	Isaac Loveridge	2·1	Band.
Circumference of abdomen, maximum	1	John Burton	33·0	O.S.
	2	James Dean	39·2	A.B.
	3	Albert Buncombe	33·0	Sto.
	4	Charles Warren	32·0	Corpl. R.M.L.I.
	5	Edgar Ellis	36·0	Engr.
	6	John Madgwick	46·0	Ship's Corpl.
Circumference of abdomen, minimum	1	Joseph Dow	25·0	Boy
	2	Charles Reynolds	25·0	A.B.
	3	Richard Hudson	20·5	Sto.
	4	William Squires	26·0	Pte.
	5	Fred Tottenham	24·0	Mid.
	6	William Lader	26·5	Drum.
Circumference of right arm, maximum	1	Alfred Saunders	11·8	O.S.
	2	Fred Humphreys	13·5	A.B.
	3	Joseph Wills	13·0	Sto.
	4	Charles Warren	12·6	Corpl. R.M.L.I.
	5	Lewis Wall	14·0	Engr.
	6	John Madgwick	13·2	Ship's Corpl.
Circumference of right arm, minimum	1	William Finch	8·5	O.S.
	2	William Archer	8·8	A.B.
	3	John Jones	10·0	Sto.
	4	Alfred Harwood	10·2	Pte.
	5	Robert Hamilton	8·3	Mid.
	6	Lionel Ranner	9·2	Drum.

TABLE III. (*continued*).

A	B	C	D	E
Circumference of left arm, maximum	1	Frederick Gregory	12·0	O.S.
	2	James Dean	13·5	A.B.
	3	Joseph Wills	13·0	Sto.
	4	Herbert Goat	12·3	Pte.
	5	Lewis Wall	12·8	Engr.
	6	John Madgwick	13·0	Ship's Corpl.
Circumference of left arm, minimum	1	William Finch	8·2	O.S.
	2	William Archer	8·6	A.B.
	3	John Jones	9·5	Sto.
	4	Sydney Ayerst	10·0	Pte.
	5	Fred Tottenham	8·0	Mid.
	6	Lionel Ranner	9·1	Drum.
Circumference of right forearm, maximum	1	John Le Quelence	12·0	O.S.
	2	Fred Humphreys	12·0	A.B.
	3	Albert Buncombe	11·6	Sto.
	4	Fred Martin	11·5	Pte.
	5	Lewis Wall	12·3	Engr.
	6	John Madgwick	12·2	Corpl.
Circumference of right forearm, minimum	1	Ernest Archer	9·2	Boy
	2	Abraham Little	9·1	A.B.
	3	John Jones	9·7	Sto.
	4	Herbert Winn	9·8	Pte.
	5	Fred Tottenham	8·7	Mid.
	6	Lionel Ranner	9·3	Drum.
Circumference of left forearm, maximum	1	John Le Quelence	11·5	O.S.
	2	James Dean	12·0	A.B.
	3	Albert Buncombe	11·6	Sto.
	4	Herbert Goat	11·3	Pte.
	5	Edgar Ellis	12·2	Engr.
	6	John Madgwick	12·2	Corpl.
Circumference of left forearm, minimum	1	Alexander Fotheringham	9·0	O.S.
	2	Abraham Little	9·2	A.B.
	3	John Jones	9·5	Sto.
	4	Herbert Winn	9·5	Pte.
	5	Fred Tottenham	8·2	Mid.
	6	Lionel Ranner	9·1	Drum.
Circumference of upper limbs, maximum	1	John Le Quelence	11.5	O.S.
	2	James Dean	12·7	A.B.
	3	Joseph Wills	12·1	Sto.
	4	Charles Warren	11·8	Corpl. R.M.L.I.
	5	Lewis Wall	12·7	Engr.
	6	John Madgwick	12·6	Corpl.
Circumference of upper limbs, minimum	1	William Finch	8·9	O.S.
	2	Abraham Little	9·1	A.B.
	3	Richard Hudson	10·1	Sto.
	4	Herbert Winn	9·9	Pte.
	5	Robert Hamilton	8·2	Mid.
	6	Lionel Ranner	9·1	Drum.
Circumference of right thigh, maximum	1	Charles Land	22·2	O.S.
	2	Frederick Humphreys	24·0	A.B.
	3	Robert Cartwright	22·1	Sto.
	4	Charles Warren	23·1	Corpl. R.M.L.I.
	5	Edgar Ellis	25·5	Engr.
	6	John Madgwick	25·2	Corpl.
Circumference of right thigh, minimum	1	Wilfrid Musgrove	16·5	Boy
	2	William Archer	17·5	A.B.
	3	John Jones	18·0	Sto.

TABLE III. (*continued*).

A	B	C	D	E
	4	William Leach	18·0	Pte.
	5	Fred Tottenham	17·8	Mid.
	6	Lionel Ranner	18·0	Drum.
Circumference of	1	John le Quelence	22·0	O.S.
left thight,	2	Fred Humphreys	23·5	A.B.
maximum	3	Robert Cartwright	22·0	Sto.
	4	Charles Warren	23·0	Corpl. R.M.L.I.
	5	Edgar Ellis	25·5	Engr.
	6	John Madgwick	24.0	Corpl.
Circumference of	1	Wilfrid Musgrove	16·2	Boy
left thigh,	2	William Archer	17·2	A.B.
minimum	3	John Jones	17·3	Sto.
	4	Alfred Harwood	18·0	Pte.
	5	Fred Tottenham	17·1	Mid.
	6	Lionel Ranner	17·0	Drum.
Right calf,	1	John Le Quelence	15·7	O.S.
maximum	2	George Higgs	16·2	A.B.
	3	Albert Buncombe	15·1	Sto.
	4	Charles Warren	16·0	Corpl.
	5	Edgar Ellis	16·6	Engr.
	6	John Madgwick	17·0	Corpl.
Right calf,	1	William Boorman	11·6	Boy
minimum	2	James Smith	12·0	A.B.
	3	John Forwood	13·0	Sto.
	4	William Leach	12·0	Pte.
	5	Fred Tottenham	12·0	Mid.
	6	Lionel Ranner	11·5	Drum.
Left calf,	1	John Le Quelence	15·6	O.S.
maximum	2	George Higgs	15·7	A.B.
	3	Albert Buncombe	14·7	Sto.
	4	Charles Warren	16·0	Corpl. R.M.L.I.
	5	Edgar Ellis	16·2	Engr.
	6	John Madgwick	17.0	Corpl.
Left calf,	1	Wilfrid Musgrove	11·1	Boy
minimum	2	James Smith	12·0	A.B.
	3	John Forwood	12·8	Sto.
	4	William Leach	12·0	Pte.
	5	Fred Tottenham	11·7	Mid.
	6	Lionel Ranner	11·2	Drum.
Lower extremities,	1	John Le Quelence	18·8	O.S.
maximum	2	Fred Humphreys	19·5	A.B.
	3	Albert Buncombe	18·2	Sto.
	4	Charles Warren	19·4	Corpl. R.M.L.I.
	5	Edgar Ellis	20·9	Engr.
	6	John Madgwick	20·8	Corpl.
Lower extremities,	1	Wilfrid Musgrove	13·8	Boy
minimum	2	John Rogers	14·9	A.B.
	3	John Jones	15·3	Sto.
	4	William Leach	15·3	Pte.
	5	Fred Tottenham	14·6	Mid.
	6	Lionel Ranner	14·4	Drum.
All extremities,	1	John Le Quelence	15·1	O.S.
maximum	2	Fred Humphreys	16·0	A.B.
	3	Albert Buncombe	15·0	Sto.
	4	Charles Warren	15·6	Corpl. R.M.L.I.
	5	Edgar Ellis	16·5	Engr.

TABLE III. (*continued*).

A	B	C	D	E
	6	John Madgwick	16·7	Corpl.
All extremities,	1	Wilfrid Musgrove	11·5	Boy
minimum	2	James Smith	12·4	A.B.
	3	John Jones	12·4	Sto.
	4	William Leach	12·7	Pte.
	5	Fred Tottenham	11·5	Mid.
	6	Lionel Ranner	11·7	Drum.
Right grip,	1	John Le Quelence	110	O.S.
maximum	2	Frank Triggs	125	P.O. 1
	3	Albert Buncombe	110	Sto.
	4	Sydney Ayerst	119	Pte.
	5	Lewis Wall	114	Engr.
	6	Sydney Comden	124	S.B.S.
Right grip,	1	Arthur Powis	55	Boy
minimum	2	Francis Puttick	58	A.B.
	3	Richard Hudson	50	Sto.
	4	William Leach	57	Pte.
	5	Arthur Bedford	56	Mid.
	6	Lionel Ranner	55	Drum.
Left grip,	1	John Le Quelence	110	O.S.
maximum	2	Frank Triggs	119	P.O. 1
	3	Albert Buncombe	105	Sto.
	4	William Barnes	103	Pte.
	5	Edgar Ellis	112	Engr.
	6	Sydney Comden	116	S.B.S.
Left grip,	1	William Kent	41	Boy
minimum	2	Daniel Emmerson	50	A.B.
	3	Richard Hudson	62	Sto.
	4	William Leach	51	Pte.
	5	Arthur Bedford	50	Mid.
	6	William Cleaver	40	Band.
Mean grip,	1	John Le Quelence	110	O.S.
maximum	2	Frank Triggs	122	P.O. 1
	3	Albert Buncombe	107	Sto.
	4	William Barnes	103	Pte.
	5	Edgar Ellis	108	Engr.
	6	Sydney Comden	120	S.B.S.
Mean grip,	1	Albert Allen	51	Boy
minimum	2	Abraham Little	60	A.B.
	3	Richard Hudson	56	Sto.
	4	William Leach	54	Pte.
	5	Fred Tottenham	90	Mid.
	6	William Cleaver	53	Band
Extension,	1	Henry Pannifer	170	O.S.
maximum	2	Thomas Galbraith	170	P.O. 2
	3	Albert Buncombe	110	Sto.
	4	Sidney Smart	140	Pte.
	5	Fred Peile	140	Mid.
	6	Fred Padwick	120	S.B.A.
Extension,	1	Thomas Dear	50	Boy
minimum	2	Samuel Evans	50	A.B.
	3	Robert Cartwright	70	Sto.
	4	Victor Watts	50	Pte.
	5	Herbert Stewart	40	Mid.
	6	William Farrell	50	Band.

TABLE II.

		B. Boys and Ord. Sea.	C. Lea Sea., Able Sea., and P.O.'s.	D. Stokers.	E. Marines.	F. Officers.	G. Miscellaneous.	H. Difference between Maximum and Minimum.	K. Total.	L. Average.	M. Maximum.	N. Minimum.	O. Boys.	P. Ord. Sea.	Q. Able Sea.	R. Total.	S. Average.
1	Number of men examined	120·	96·	11·	37·	24·	17·	—	305·	—	—	—	46·	72·	96·	214·	—
2	Age, in years. Max.	23·00	35·00	25·00	34·00	37·00	38·00	15·00	192·	32·00	38·00	23·00	—	—	—	—	—
3	Min.	16·50	19·90	20·00	18·60	15·80	17·10	4·20	107·9	17·98	20·00	15·80	—	—	—	—	—
4	Mean	18·50	23·80	22·80	23·00	20·30	24·95	6·45	133·35	22·22	24·95	18·50	17·42	19·19	23·80	—	20·136
5	Weight, in pounds. Max.	182·00	196·00	172·00	172·00	203·00	234·00	62·00	1159·00	193·16	234·00	172·00	—	—	—	—	—
6	Min.	107·00	112·00	128·00	120·00	100·00	110·00	28·00	667·00	111·16	128·00	100·00	—	—	—	—	—
7	Mean	131·46	141·46	147·54	141·18	140·95	149·61	18·15	852·30	142·03	149·61	131·46	127·45	134·69	141·46	—	134·533
8	Height.* Max.	71·70	72·20	70·50	71·50	74·50	70·30	4·20	430·70	71·78	74·50	70·30	—	—	—	—	—
9	Min.	61·20	51·70	65·00	62·50	61·80	61·80	13·30	363·30	60·55	65·00	51·70	—	—	—	—	—
10	Mean	66·20	66·10	67·70	68·60	67·80	66·20	2·50	402·60	67·10	68·60	66·10	65·81	66·43	66·10	—	66·113
11	Chest circumference. Complete inspiration. Max.	38·60	42·50	39·70	39·70	41·80	45·00	6·40	—	41·91	45·00	38·60	—	—	—	—	—
12	Min.	31·50	32·70	34·50	33·00	30·00	32·70	4·50	—	32·40	34·50	30·00	—	—	—	—	—
13	Mean	35·13	36·50	36·94	33·34	35·10	36·73	1·84	—	35·95	36·94	35·10	33·50	35·57	36·50	—	35·190
14	expiration. Max.	35·50	39·00	34·30	34·50	37·60	42·00	7·70	—	37·15	42·00	34·30	—	—	—	—	—
15	Min.	25·20	29·70	31·50	29·00	26·20	26·50	6·30	—	28·01	31·50	25·20	—	—	—	—	—
16	Mean	31·45	32·95	32·77	31·97	30·83	32·85	2·12	—	32·13	32·95	30·83	30·71	32·01	32·95	—	31·890
17	Normal. Max.	36·50	40·70	37·00	36·00	37·70	43·50	7·50	—	38·56	43·50	36·00	—	—	—	—	—
18	Min.	29·20	31·37	33·00	31·50	28·80	30·50	4·20	—	30·72	33·00	28·80	—	—	—	—	—
19	Mean	33·25	34·62	34·85	33·83	32·96	34·81	1·89	—	34·05	34·85	32·96	32·10	33·79	34·62	—	33·503
20	expansion. Max.	7·90	5·50	5·50	8·20	6·00	8·00	2·70	—	6·85	8·20	5·50	—	—	—	—	—
21	Min.	1·70	1·70	3·00	1·80	2·20	2·10	1·30	—	2·08	3·00	1·70	—	—	—	—	—
22	Mean	3·68	3·71	3·95	3·84	4·20	3·80	0·52	—	3·86	4·20	3·68	2·78	3·55	3·71	—	3·346
23	Ratio of mean chest expansion to mean normal chest circumference. (Col. 22, col. 19)	9·03	9·16	8·82	8·82	7·84	9·16	—	—	8·81	7·84	9·16	11·18	9·51	9·33	—	10·01
24	Abdomen, circumference of. Max.	33·00	39·20	33·00	32·00	36·00	46·00	14·00	—	36·53	46·00	32·00	—	—	—	—	—
25	Min.	25·00	25·00	20·50	26·00	24·00	26·50	6·00	—	24·50	26·50	20·50	—	—	—	—	—
26	Mean	27·37	29·62	29·30	28·81	28·66	32·09	4·72	—	29·30	32·09	27·37	27·71	28·14	29·62	—	28·490
27	Arm, upper right. Max.	11·80	13·50	13·00	12·60	14·00	13·20	1·40	—	13·01	14·00	11·80	—	—	—	—	—
28	Min.	8·50	8·80	10·00	10·20	8·30	9·20	1·90	—	9·16	10·20	8·30	—	—	—	—	—
29	Mean	10·44	11·12	10·15	11·20	10·33	11·25	1·10	—	10·74	11·25	10·15	10·18	10·43	11·12	—	10·576
30	left. Max.	12·00	13·50	13·00	12·30	12·80	13·00	1·50	—	12·76	13·50	12·00	—	—	—	—	—
31	Min.	8·20	8·60	9·50	10·00	8·00	9·10	2·00	—	8·90	10·00	8·00	—	—	—	—	—
32	Mean	10·27	10·92	10·90	11·00	9·94	11·02	1·08	—	10·67	11·02	9·94	9·92	10·36	10·92	—	10·400
33	Ratio of mean circumference R. upper arm to ditto L. upper arm. (Col. 29, col. 32)	0·983	0·982	1·073	0·982	0·962	0·979	—	—	0·993	1·073	1·962	0·974	0·993	0·982	—	0·983
34	Mean of mean circumference of R. and L. upper arms. Max. (Mean of cols. 29 and 32)	11·90	13·50	13·00	12·45	13·40	13·10	1·60	—	12·89	13·50	11·90	—	—	—	—	—
35	Min.	8·35	8·70	9·80	10·10	8·15	9·15	1·95	—	9·04	10·10	8·15	—	—	—	—	—
36	Mean	10·35	11·02	10·52	11·10	10·13	11·13	1·00	—	10·70	11·13	10·13	10·050	10·395	11·020	—	10·488
37	Forearm, R. circumference of. Max.	12·00	12·00	11·60	11·50	12·37	12·25	0·87	—	11·95	12·37	11·50	—	—	—	—	—
38	Min.	9·20	9·10	9·70	9·80	8·75	9·30	1·05	—	9·47	9·80	8·75	—	—	—	—	—
39	Mean	10·24	10·67	10·73	10·48	10·26	10·77	0·53	—	10·52	10·77	10·24	10·09	10·37	10·67	—	10·376
40	L.	11·50	12·00	11·60	11·30	12·25	12·25	0·95	—	11·81	12·25	11·30	—	—	—	—	—
41	Min.	9·00	9·20	9·50	9·50	8·25	9·10	1·25	—	9·09	9·50	8·25	—	—	—	—	—
42	Mean	10·11	10·54	10·65	10·38	9·95	10·27	0·59	—	10·31	10·65	9·95	9·96	10·23	10·54	—	10·243
43	Ratio of mean circumference R. forearm to ditto L. forearm. (Col. 39, col. 42)	0·987	0·987	0·992	0·990	0·969	0·953	—	—	0·979	0·992	0·953	0·987	0·986	0·987	—	0·987
44	Mean of mean circumference of R. and L. forearms. Max. (Mean of cols. 39 and 42)	11·75	12·00	11·60	11·40	12·31	12·25	0·91	—	11·88	12·31	11·40	—	—	—	—	—
45	Min.	9·10	9·15	9·60	9·55	8·50	9·20	1·15	—	9·20	9·65	8·50	—	—	—	—	—
46	Mean	10·17	10·60	10·69	10·43	10·10	10·52	0·59	—	10·41	10·69	10·10	10·025	10·300	10·605	—	10·310
47	Ratio of mean circumference of forearms to ditto upper arms. (Cols. 46, col. 36)	1·037	1·039	0·984	1·073	1·002	—	—	—	1·037	1·073	0·984	1·002	1·009	1·039	—	1·017
48	Upper extremity, R. Mean of mean circumferences. Max. (Mean of cols. 29 and 39)	11·75	12·75	11·77	12·03	12·68	12·75	1·00	—	12·283	12·75	11·75	—	—	—	—	—
49	Min.	9·06	9·24	9·85	9·80	8·62	9·25	1·23	—	9·303	9·85	8·62	—	—	—	—	—
50	Mean	10·312	10·912	10·889	10·848	10·295	10·773	0·614	—	10·671	10·912	10·295	10·131	10·403	10·912	—	10·512
51	L. Max. (Mean of cols. 32 and 42)	11·60	11·90	12·25	11·80	12·37	12·62	1·02	—	12·090	12·62	11·60	11·00	11·60	11·90	—	11·560
52	Min.	8·81	9·12	9·50	9·90	8·12	9·10	1·78	—	9·091	9·90	8·12	9·00	8·81	9·12	—	8·977
53	Mean	10·190	10·730	10·775	10·690	9·945	10·645	0·830	—	10·490	10·775	9·945	9·940	10·295	10·730	—	10 321
51, 54	Ratio of the mean of the mean circumferences of R. upper extremity to ditto L. upper extremity. (Col. 49, col. 52)	0·998	0·983	0·989	0·980	0·966	0·988	—	—	0·982	0·989	0·966	0·981	0·983	—	—	0·981
55	Upper extremity, mean of mean circumferences of R. and L. Max. (Mean of cols. 50 and 53)	11·50	12·70	12·10	11·80	12·77	12·68	1·27	—	12·25	12·77	11·50	—	—	—	—	—
56	Min.	8·93	9·12	10·19	9·60	8·24	9·17	1·95	—	9·25	10·19	8·24	—	—	—	—	—
57	Mean	10·265	10·812	10·607	10·765	10·120	10·823	0·703	—	10·565	10·823	10·120	10·017	10·357	10·812	—	10·395
58	Thigh, R. circumference of. Max.	22·25	24·00	22·10	23·10	25·50	24·00	3·40	—	23·49	25·50	22·25	—	—	—	—	—
59	Min.	16·50	17·50	18·00	18·00	17·87	17·00	1·50	—	17·47	18·00	16·50	—	—	—	—	—
60	Mean	18·571	19·964	20·417	19·905	20·406	20·125	1·846	—	19·898	20·417	18·571	19·06	19·62	19·96	—	19·546
61	L. Max.	22·00	23·50	22·00	23·00	25·50	24·00	3·50	—	23·33	25·50	22·00	—	—	—	—	—
62	Min.	16·25	17·25	17·30	18·00	17·13	17·00	1·75	—	17·15	18·00	16·25	—	—	—	—	—
63	Mean	18·409	19·858	20·128	19·843	20·202	20·129	1·793	—	19·761	20·202	18·409	18·85	19·47	19·85	—	19·390
64	Ratio of mean circumference R. thigh to ditto L. thigh. (Col. 60, col. 63)	0·991	0·994	0·985	0·996	0·990	1·000	—	—	0·993	1·000	0·985	0·988	0 992	00·994	—	0·992
65	Thighs, R. and L., mean of mean circumferences of. Max. (Mean of cols. 60 and 63)	22·12	23·75	22·05	23·05	25·50	24·00	3·45	—	23·41	25·50	22·05	—	—	—	—	—
66	Min.	16·37	17·37	17·65	18·00	17·50	17·00	1·63	—	17·31	18·00	16·37	—	—	—	—	—
67	Mean	18·490	19·911	20·322	19·824	20·300	20·127	1·832	—	19·819	20·322	18·490	18·955	19·545	19 911	—	19·503
68	Leg, R., circumference of. Max.	15·70	16·25	15·13	16·00	16·62	17·00	1·87	—	16·11	17·00	15·13	—	—	—	—	—
69	Min.	11·60	12·00	13·00	12·00	12·00	11·50	1·50	—	12·01	13·00	11·50	—	—	—	—	—
70	Mean	13·206	13·602	13·885	13·309	13·873	13·994	0·788	—	13·644	13·994	13·206	13·17	13·22	13 60	—	13·330
71	L. Max.	15·63	15·75	14·75	15·50	16·25	17·00	2·25	—	16·25	17·00	15·63	—	—	—	—	—
72	Min.	11·13	12·00	12·87	11·80	11·75	11·20	1·74	—	11·79	12·87	11·13	—	—	—	—	—
73	Mean	13·119	13·498	13·672	13·425	13·720	13·870	0·751	—	13·550	13·870	13·119	13·05	13·13	13·49	—	13·223
74	Ratio of mean circumference of R. leg to ditto L. leg. (Col. 70, col. 73)	0·993	0·992	0·984	1·008	0·987	0·991	—	—	0·993	1·008	0·984	0·990	0·993	0·992	—	0·991
75	Legs, R. and L., mean of mean circumferences of. Max. (Mean of cols. 70 and 73)	15·65	16·00	14·94	15·75	16·43	17·00	2·06	—	15·96	17·00	14·94	—	—	—	—	—
76	Min.	11·36	12·00	12·93	11·90	11·87	11·35	1·58	—	11·90	12·93	11·35	—	—	—	—	—
77	Mean	13·162	13·550	13·728	13·367	13·771	13·932	0·770	—	13·597	13·932	13·162	13·110	13·175	13·550	—	13·278
78	Ratio of mean circumference of legs to mean circumference of thighs. (Col. 77, col. 67)	1·404	1·460	1·480	1·483	1·474	1·444	—	—	1·457	1·483	1·404	1·448	1·483	1·480	—	1·468
79	Lower extremity, R., mean of mean circumferences. Max. (Mean of cols. 60 and 70)	18·85	19·68	18·44	19·55	21·06	21·12	2·68	—	21·12	21·12	18·44	17·80	18·85	19·68	—	18·77
80	Min.	14·85	15·00	15·50	15·50	14·93	14·75	0·75	—	14·75	15·50	14·75	11·65	14·85	15·00	—	13·93
81	Mean	16·150	16·785	17·175	16·575	17·137	16·880	1·025	—	16·783	17·175	16·150	15·895	16·405	16 785	—	16·361
82	Max. (Mean of cols. 63 and 73)	18·80	19·43	18·12	19·25	20·87	20·50	2·75	—	19·495	20·87	18·12	17·65	18 80	19·43	—	18·626
83	Min.	13·69	14·10	15·74	15·30	14·44	14·10	2·05	—	14·561	15·74	13·69	13·69	14·65	14·10	—	14·146
84	Mean	16·124	16·623	16·872	16·617	16·957	16·521	0·833	—	16·619	16·957	16·124	15·962	16·287	16·623	—	16·290
85	Ratio of the mean of the mean circumferences of R. lower extremity to ditto L. lower extremity. (Col. 81, col. 84)	0·998	0·990	0·982	1·002	0·989	0·978	—	—	0·990	1·002	0·978	1·004	0·992	0·990	—	0·995
86	Lower extremity, mean of mean circumferences of R. and L. Max. (Mean of cols. 81 and 84)	18·80	19·56	18·28	19·40	20·96	20·81	2·68	—	19·63	20·96	18·28	—	—	—	—	—
87	Min.	13·97	14·30	14·30	14·30	14·68	14·42	1·43	—	14·74	14·74	13·97	—	—	—	—	—
88	Mean	15·826	16·729	17·025	16·620	17·050	17·132	1·306	—	16·730	17·132	15·826	16·03	16·36	16·72	—	16·370
89	Ratio of mean circumference of thighs to ditto upper arms. (Col. 67, col. 36)	0·559	0·553	0·517	0·559	0·499	0·552	—	—	0·539	0·559	0·499	0·530	0·531	0·553	—	0·537
90	legs forearms. (Col. 77, col. 46)	0·772	0·782	0·778	0·780	0·733	0·755	—	—	0·765	0 782	0·733	0·764	0·781	0·782	—	0·776
91	lower extremities to ditto upper extremities. (Col. 88, col. 57)	0·648	0·646	0·623	0·647	0·593	0·631	—	—	0 631	0·648	0·593	0 624	0·633	0·646	—	0·635
92	Extremities, mean of mean circumferences of upper and lower. Max. (Mean of cols. 57 and 88)	15·10	16·06	15·01	15·60	16·52	16·74	1·73	—	15·83	16·74	15·01	—	—	—	—	—
93	Min.	11·51	12·40	12·40	12·70	11·52	11·79	1·19	—	12·05	12·70	11·51	—	—	—	—	—
94	Mean	13·045	13·770	13·816	13·692	13·585	13·978	0·933	—	13·647	13·978	13·045	13·02	13·35	13·77	—	13·380
95	Pressure, in pounds, exerted by grip of R. hand. Max.	110·	125·	110·	119·	114·	134·	15·	702·	117·	125·	110·	—	—	—	—	—
96	Min.	55·	58·	50·	57·	56·	55·	8·	331·	55·	58·	50·	—	—	—	—	—
97	Mean	79·525	88·968	86·545	83·918	82·666	87·925	9·443	509·547	84·891	88·968	79·525	72·71	82·45	88·96	—	81·373
98	L. Max.	110·	119·	105·	103·	112·	116·	16·	665·	110·83	119·	103·	—	—	—	—	—
99	Min.	41·	50·	62·	51·	50·	40·	22·	294·	49·	62·	40·	—	—	—	—	—
100	Mean	76·516	86·302	87·272	80·756	75·875	81·933	11·397	488·654	81·442	87·272	75·875	70·08	79·19	86·30	—	78·523
101	Ratio of mean pressure exerted by R. grip to ditto L. grip. (Col. 97, col. 100)	0·962	0·972	1·008	0·962	0·917	0·930	—	—	0·959	1·008	0·917	0·963	0·960	0·972	—	0·964
102	Mean of mean pressure, in pounds, exerted by grips of R. and L. hands. (Mean of cols. 97 and 100.) Max.	110·	122·	107·50	103·	108·5	120·	19·	671·	111·83	122·	103·	—	—	—	—	—
103	Min.	51·5	60·	56·	54·	90·	53·5	33·50	365·	60·83	90·	51·5	—	—	—	—	—
104	Mean	78·020	87·635	86·908	82·337	79·270	84·929	9·615	499·099	83·183	87·635	78·020	71·40	80·82	87 63	—	79·950
105	Tensile force, in pounds. Max.	170·	170·	110·	140·	140·	120·	60·	850·	141·66	170·	140·	—	—	—	—	—
106	Min.	50·	50·	70·	50·	40·	50·	30·	310·	51·66	70·	40·	—	—	—	—	—
107	Mean	89·084	97·458	94·181	96·000	88·125	90·250	9·333	555·098	93·010	97·458	88·125	94·69	97·45	90·366	—	90·366
108	Weight, in pounds, lifted by R. upper extremity. Max.	190·	220·	200·	200·	210·	200·	30·	1320·	203·333	220·	190·	—	—	—	—	—
109	Min.	60·	70·	120·	90·	90·	100·	60·	530·	88·33	120·	60·	—	—	—	—	—
110	Mean	137·068	154·016	141·818	148·800	143·625	149·375	17·033	873·702	145·617	154·016	137·068	124·44	145·61	154·016	—	141·383
111	L. Max.	195·	370·	210·	200·	200·	190·	180·	1965·	227·50	370·	190·	—	—	—	—	—
112	Min.	90·	90·	110·	110·	96·	80·	30·	576·	96·00	110·	90·	—	—	—	—	—
113	Mean	139·743	160·000	152·666	145·000	138·375	143·041	21·625	878·825	146·470	160·	138·375	130·33	145·49	160·00	—	145·273
114	Ratio of mean weight lifted by R. upper extremity to ditto L. upper extremity. (Col. 110, col. 113)	1·019	1·038	1·073	0·974	0·970	0·958	—	—	1·000	1·073	0·958	0·40	0·998	1·038	—	1·027
115	Mean of mean weights lifted by R. and L. upper extremities. Max. (Mean of cols. 110 and 113)	192·50	285·00	205·00	195·00	205·00	187·50	97·50	1270·	211·66	285·00	187·50	—	—	—	—	—
116	Min.	80·00	80·	120·	100·	90·	95·	40·	565·	94·16	120·00	80·	—	—	—	—	—
117	Mean	138·405	157·053	147·242	146·944	140·000	146·208	18·648	875·852	145·975	157·053	138·405	127·38	145·55	157·05	—	143·326
118	Index of strength. (Mean of cols. 104, 107 and 117, divided by 65·30.) Max.	2·24	2·43	2·15	2·03	2·30	2·04	0·45	13·24	2·20	2·43	2·03	—	—	—	—	—
119	Min.	1·03	1·21	1·45	1·10	1·00	1·08	0·45	—	1·14	1·45	1·00	—	—	—	—	—
120	Mean	1·553	1·760	1·707	1·658	1·552	1·640	0·208	—	1·642	1·760	1·552	1·444	1·633	1·760	—	1·612
121	stature and dimension. (Mean of cols. 7, 10, 19 and 92, divided by 50·84.) Max.	1·37	1·58	1·44	1·43	1·62	1·77	0·40	—	1·535	1·77	1·37	—	—	—	—	—
122	Min.	1·02	1·07	1·18	1·15	1·00	1·06	0·18	—	1·08	1·18	1·00	—	—	—	—	—
123	Mean	1·236	1·258	1·310	1·266	1·255	1·301	0·740	—	1·271	1·301	1·236	1·176	1·232	1·258	—	1·218
124	physique. (Mean of cols. 120 and 123.) Max.	1·657	1·764	1·801	1·680	1·880	1·934	0·277	—	1·786	1·934	1·657	1·542	1·657	1·764	—	1·981
125	Min.	1·064	1·160	1·347	1·152	1·025	1·087	0·322	—	1·139	1·347	1·025	1·064	1·147	1·160	—	1·185
126	Mean	1 394	1·509	1·508	1·462	1·403	1·470	0·115	—	1·456	1·509	1·394	1·310	1·427	1·509	—	1·415
127	Right-handed	115·	83·	11·	35·	23·	16·	—	283·	—	—	—	—	—	—	—	—
128	Left-handed	5·	13·	0·	2·	1·	0·	—	21·	—	—	—	—	—	—	—	—
129	Ambidextrous	0·	0·	0·	0·	0·	1·	—	1·	—	—	—	—	—	—	—	—
130	Right-legged	112·	83·	10·	35·	22·	16·	—	278·	—	—	—	—	—	—	—	—
131	Left-legged	8·	13·	1·	2·	2·	1·	—	27·	—	—	—	—	—	—	—	—
132	Ambipedous	0·	0·	0·	0·	0·	0·	—	0·	—	—	—	—	—	—	—	—

TABLE III. (*continued*).

A	B	C	D	E
Weight lifted with	1	George Coaffee	190	O.S.
right hand,	2	Frank Triggs	220	P.O. 2
maximum	3	Albert Buncombe	200	Sto.
	4	Fred Martin	200	Pte.
	5	Archib. Urmston	210	Major
	6	Sydney Comden	200	S.B.S.
Weight lifted with	1	Sidney Claw	60	Boy
right hand,	2	Edward Smees	70	A.B.
minimum	3	Richard Hudson	120	Sto.
	4	Alfred Harwood	90	Pte.
	5	Fred Tottenham	90	Mid.
	6	William Farrell	100	Band.
Weight lifted with	1	George Coaffee	195	O.S.
left hand,	2	Charles Smith	370	A.B.
maximum	3	Albert Buncombe	210	Sto.
	4	Richard Truefitt	200	Pte.
	5	Archib. Urmston	200	Major
	6	Henry Maidlow	190	Band.
Weight lifted with	1	John Aunett	90	O.S.
left hand,	2	Edward Smees	90	A.B.
minimum	3	William Callardyce	110	Sto.
	4	Alfred Harwood	110	Pte.
	5	Herbert Stewart	96	Mid.
	6	William Lader	80	Drum.
Mean of weight	1	George Coaffee	192	O.S.
lifted with right	2	Charles Smith	285	A.B.
and left hands,	3	Albert Buncombe	205	Sto.
maximum	4	Richard Truefitt	195	Pte.
	5	Archib. Urmston	205	Major
	6	Henry Maidlow	187	Band.
Mean of weight	1	Sidney Claw	80	Boy
lifted with right	2	Edward Smees	80	A.B.
and left hands,	3	William Callardyce	120	Sto.
minimum	4	Alfred Harwood	100	Pte.
	5	Fred Tottenham	90	Mid.
	6	William Lader	95	Drum.
Index of strength,	1	John Le Quelence	2·24	O.S.
maximum	2	Charles Smith	2·48	A.B.
	3	Albert Buncombe	2·15	Sto.
	4	Richard Truefitt	2·03	Pte.
	5	Archib. Urmston	2·30	Major
	6	Sydney Comden	2·04	S.B.S.
Index of strength,	1	Sidney Claw	1·03	Boy
minimum	2	Edward Bolton	1·21	A.B.
	3	William Callardyce	1·45	Sto.
	4	Alfred Harwood	1·10	Pte.
	5	Herbert Stewart	1·00	Mid.
	6	William Cleaver	1·08	Band.
Index of size,	1	Walter Gover	1·37	O.S.
maximum	2	Fred Humphreys	1·58	A.B.
	3	Albert Buncombe	1·44	Sto.
	4	Charles Warren	1·43	Corpl. R.M.L.I.
	5	Edgar Ellis	1·62	Engr.
	6	John Madgwick	1·77	Ship's Corpl.
Index of size,	1	Wilfrid Musgrove	1·02	Boy
minimum	2	Abraham Little	1·07	A.B.

TABLE III. (*continued*).

A	B	C	D	E
	... 3 ...	John Jones	1·18 ...	Sto.
	... 4 ...	George Franklin	1·15 ...	Pte.
	... 5 ...	Fred Tottenham	1·00 ...	Mid.
	... 6 ...	William Cleaver	1·06 ...	Band.
Index of physique,	... 1 ...	John Le Quelence	1·87 ...	O.S.
maximum	... 2 ...	Frank Triggs	1·89 ...	P.O. 1
	... 3 ...	Albert Buncombe	1·80 ...	Sto.
	... 4 ...	Sidney Smart	1·68 ...	Pte.
	... 5 ...	Edgar Ellis	1·88 ...	Engr.
	... 6 ...	John Madgwick	1·93 ...	Corpl.
Index of physique,	... 1 ...	Sidney Claw	1·06 ...	Boy
minimum	... 2 ...	Samuel Evans	1·19 ...	A.B.
	... 3 ...	Richard Hudson	1·34 ...	Sto.
	... 4 ...	George Franklin	1·34 ...	Pte.
	... 5 ...	Herbert Stewart	1·02 ...	Mid.
	... 6 ...	William Cleaver	1·08 ...	Band.

TABLE IV.

	Number Weighed.		Weight in pounds of 100 men.		Weight in pounds of 1 man.		Ratio.	
	M.	E.	M.	E.	M.	E.	M.	E.
1. Stokers ...	110	11	14396	14754	144·0	147·5	1·051	1·081
2. Marines ...	78	37	14123	14118	141·0	141·1	1·029	1·034
3. Seamen ...	150	216	13688	13646	137·0	136·4	1·000	1·000
TOTAL ...	338	264	——	——	——	——	——	——
MEAN ...	—	—	14069	14172	140·6	141·6	——	——

E.—Weighed immediately after leaving England, October, 1897.
M.—Weighed at Manila in March, 1899.